Screw Worm Eradl — cc also to O.H. Graham Adolphus Hotel

NOV 2 3 1964

Dr. Knipling's comments on O.H.Graham's memo of Oct. 20 to WCMcDuffie
Subject: Screw-worm ecology studies in Mexico

10-26-64

Graham and others have done considerable thinking on this.

I am still leary of too wide swaths without considerable practical experience. 8 mile swathsmight be adequate in a given area but not in another. The season might also be a factor. In general, though, I think swaths can be widened gradually -- 2 to 4, 4 to 6, etc., rather than big jumps like 4 to 8.

In planning eradication in Mexico, I feel that we should think in terms of at least 300 mile strips--Graham mentioned 240 miles. I would suggest at least 300 miles. I think the evidence is clear that some flies move 300 miles. This has been indicated in the spring and fall for 2 years.

If the program were moved by stages in 300-350 mile zones, there should be little need for hot spotting.

Theoretically, it should be possible to eradicate screw-worms all the way to panama by dropping 300-350 mile zones and gradually making the shift to the next zone during the winter or midsummer when migration appears to be a minor factor. In practice, however, extra flies, planes, survey personnel would no doubt be needed.

Ecological surveys as proposed would seem to be an essential part of the program. There should be set up in ADE a strong ecological survey and population density determination group. A good study of this kind could double the efficiency of the program. However, the operating group would have to be flexible and act in accordance with the findings of the survey group.

Some observations on biological control might be indicated, but studies to explain why insects are scarce or abundant are usually complex. I am glad to know that screw-worm populations tend to be low in Mexico. I think this can be explained by density of domestic animals, density of wild animals, animal husbandry practices (herdsmen) and possibly extremes in weather.

I have always thought that sterile flies are not used with maximum efficiency. We might be able to cover two times the area now covered if the number of flies released are quickly adjusted to the circumstances. For example, there is no need to liberate 1000 or even 600 flies per square mile if no reports of screw-worms are received in a given area for several weeks. In areas suspected as being free, 200 should be ample to protect against an occasional migrant or even from flies that might emerge from an animal infestation shipped into an area. Last winter, for example, a low maintenance release rate, say 200 per square mile in the Texas and northern Mexico area would

probably have achieved the same results as 1,000 per square mile. On the other hand, if half of the flies had been used to widen the barrier by 100 miles or so, we may have had practically no cases in Texas this spring. The same might be said this fall. If half the flies released in Texas, New Mexico and the first 100 miles in Mexico had been shifted to a zone 100 miles south of the release zone during July, August and mid-September, we might not of had any screw-worms in Texas this fall.

I might summerize this by saying that if begining last winter, one half of the flies used in the first 150 miles of the barrier had been used to widen the barrier by 100 miles and this had been maintained throughout the year we might have kept flies out of Texas or reduced them to 1/10 of the number of cases we did have, without increasing the fly production. By continuing such procedures, gradually going further south but maintaining a barrier 300-350 miles wide we might push the fly below the area that would threaton our area in spite of a favorable season such as Graham mentioned.

Screw-Worm Eradication

Entomology Research Division
Kerrville, Texas

Screw-worm ecology studies in Mexico

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October 20, 1964

Mr. Baumhover and I were at Poza Rica, Vera Cruz, the week before last to see the field trial being conducted by Dr. Hightower and Mr. Alley in cooperation with ADE. We also met with Drs. Sharman and Meadows of ADE to discuss the future screw-worm program in Mexico and the requirements for additional ecological studies in Mexico. Dr. Hightower gave us a first-hand summary of the information which had been obtained up to that time. Although we did not anticipate the results which have been observed at the time the test was planned, I feel that the Poza Rica study has been worth-while. From the information obtained so far, the following tentative conclusions can be drawn:

1) During the time of this trial, the density of native screw-worm flies in the Poza Rica area was low. (This statement is supported not only by the egg mass data, but by surveys of screw-worm infestation in ranch animals in the area.)

2) Irradiated male screw-worm flies of the strain currently produced at Mission survive, disperse, and mate with native females under Vera Cruz conditions.

3) There were no significant differences in the percentage of sterile egg masses collected at different distances from the release line up to a distance of 4 miles. (Larger numbers of egg masses would help us to evaluate the significance of the variations which have been observed, but if the numbers obtained since August 29 (2-1/2 weeks after fly release began) are pooled, the following percentages of sterility have been observed: Zero miles - 43%; 1 mile - 27%; 2 miles - 43%; and 4 miles - 43%. While we have not attempted a statistical analysis, it is unlikely that the result at 1 mile is significantly different from the others.)

We were all in agreement that the trial would continue until approximately the end of October, and a recent increase in the number of egg masses collected causes us to hope that larger numbers of egg masses will be obtained in October than in either August or September.

We also discussed the type of studies which should be undertaken in the future. Of course, our efforts will be limited by the availability of people and travel funds, and it seems very unlikely that we will have more than one or two professionals available for these studies during the next year. In view of this limitation, it becomes highly important that we concentrate our effort on those phases of the research which will supply information most likely to give the greatest immediate assistance to the eradication program.

A number of items were suggested. Mr. Baumhover pointed out the importance of making an ecological survey similar to the one that Dr. Hightower made last winter and spring, but in the zone below the 200-mile release line (see attached copy of a memo written by Mr. Baumhover on September 18). I proposed that a series of studies in localities typical of the more important ecological zones in Mexico would be worthwhile. These studies would attempt to locate isolated or semi-isolated populations of screw-worm flies, the existence of seasonal barriers to screw-worm migration, and the survival and dispersal of sterilized flies in these various localities after a one-time release from a single point.

While we need more information before we can draw definite conclusions, the information available from ADE surveys and other sources indicates that in most regions of Mexico screw-worm populations seldom reach the density which we used to see in Texas. This low-population theory is further supported by information obtained in the Poza Rica trial. If all the available bits of information are combined, it appears quite possible that some biological or other natural mechanisms of control with which we are not familiar may limit screw-worm populations in Mexico. If this is happening, it is very important that we attempt to determine the nature of the biological control mechanisms which are operating and estimate their effectiveness under different climatic conditions. At the same time, the effects of animal husbandry practices and wild animal hosts on screw-worm populations should be considered. Obviously it would not be desirable to undertake long-term studies on biological control, since it is within the realm of possibility that screw-worms will be eradicated from most of Mexico within two or three years.

In considering the future of the eradication program, an overriding consideration is the fact that for the next two years there will probably not be any sterile flies available for use in Mexico other than those which can be produced by the Mission plant. At the present time these flies are, for the most part, being used to lay down an imperfect barrier along a line from Brownsville, Texas, to Douglas, Arizona, to protect Texas and the States north and east of Texas from migrating Mexican flies. During the less than three years it has been in operation the program has been favored by dry weather. It is very likely that the present barrier would be completely overwhelmed if weather conditions highly favorable for screw-worm

development should ever occur over all of Northern Mexico and the Southwestern United States for a period of several weeks (such as the spring of 1957). It continues to be possible that the barrier could be overwhelmed next year and all of the States west of the Mississippi infested to the same extent they were prior to 1962, despite the best effort of the Mission group, unless the screw-worm population in Mexico can be pushed much farther south.

On the other hand, it is also conceivable that sufficient flies can be produced in the Mission plant to eradicate screw-worms from all of Northern Mexico (also Arizona and California). Northwestern Mexico (Chihuahua, Sonora, Baja California, Sinaloa, and Durango) is a vast area, but in the winter most of it is cold or dry or both. Enough flies could be produced in Mission to maintain a barrier in Tamaulipas, Nuevo Leon, and Coahuila and at the same time release enough flies in Northwestern Mexico, Arizona, and California to eliminate overwintering as far south as Mazatlan. Of course, altered patterns of release would have to be developed for use in such a program.

It seems that the data already obtained justify large-scale trials of an 8-mile swath width by ADE in areas believed to contain only small numbers of screw-worms. In addition to a greater swath width, it seems that in large areas of Mexico it might be possible to increase the time interval between releases and reduce the rate of sterile fly release to a much lower rate than has been used in the Southwestern program to date. It would be necessary to support such a low-density release pattern with hot spotting of any cases that were reported and an intensive survey effort.

If screw-worms could be eliminated from this tremendous northwestern area with the help of the weather, regular release beginning in the spring could be concentrated in an area below a line drawn from Tampico to Novillero, Nayarit (just below the southern end of Sinaloa). If an adequate survey effort were available and if ADE possessed sufficient mobility to respond to case reports within 1 week, all of the area north of this line, both Northern Mexico and the United States, could be handled next spring by the hot-spot approach and the new barrier could be below the line. As an example, the barrier could cover an area from Tampico to Vera Cruz to Bahia Dulce, Guerrero, and up the Pacific Coast to Novillero, Nayarit. This would be an area of only 160,000 square miles but would give a barrier across all of Mexico at least 240 miles in depth.

In this connection, Dr. Davis has recently proposed an ingenious scheme to use IBM equipment to speed the handling of case reports. He has shown how the reinfestation of Texas this month could have been predicted in advance (and perhaps avoided) if the case reports could have been consolidated and evaluated more rapidly. We understand that ADE is investigating the availability of the necessary equipment, which perhaps could be obtained

on loan, and studying the changes which would be needed in their reporting system.

Such a radical change in fly release would involve a gamble that ADE probably would not want to take on the basis of the information presently available. It is true that the proposal outlined above includes some theorising about areas which have never been surveyed. We have considerable information now about the states of Chihuahua and Sonora, and we can expect that screw-worms will be virtually eradicated there this winter by cold, dry weather. We have much less information about Baja California, Sinaloa, Durango, and Zacatecas, but we know that these areas tend to be cold or dry, or both, during the winter months and it is possible that screw-worm overwintering in these states is confined to a few very limited areas. Additional studies are needed in southern Coahuila and Chihuahua to determine the extent of overwintering in those areas.

In our discussions, we ignored the political and administrative aspects of the future program, since these were unknown to us and limited our thinking to the technical aspects.

It is my belief that new, more economical patterns of sterile fly distribution must be developed if a successful eradication program is carried out in Northern Mexico within the next two to three years, and that the ecological studies conducted by Entomology Research Division should be planned so as to provide maximum assistance to the development of these patterns. Any comments and guidance which you and Dr. Knipling would care to give us will be appreciated.

O. H. Graham
Investigations Leader
Livestock Insects Investigations

Attachment

cc:
R. S. Sharman
S. D. Gartman
A. H. Baumhover

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Mission

OCT 1 1964

September 18, 1964

To: O. H. Graham
Investigations Leader
Livestock Insects Investigations
Kerrville, Texas

From: A. H. Baumhover
Entomologist in Charge

Subject: Future screw-worm research activities in Mexico

In a conference this morning with Drs. Hightower and Davis, the role of screw-worm research personnel in the overall planning, survey, and evaluation of future eradication activities in Mexico was discussed. Dr. Hightower has spent one year, almost full time, in the Northern States of Mexico to provide the best information available to the program for developing release strategy. I presume this will remain a function of our research program along with various field trials as currently under way in Vera Cruz. If the eradication program in Mexico is expanded, cooperation and exchange of information among the various agencies involved would become increasingly important. Specific reference is made to the survey being considered by the Agency for International Development. Assuming that this survey information would be available to us, its value might be enhanced if we have an opportunity to assist in outlining specific data needed, methods, etc.

Whether or not eradication activities are expanded in Mexico, it is most urgent that studies be extended below the present 200 mile barrier as well as to fill in some of the gaps in the present 200 mile zone. For example, if natural barriers exist relatively short distances below the arbritrary 200 mile line, it may be more efficient to extend coverage to these barriers than to continually combat reinfestations from untreated areas.

Since other groups are involved, than Entomology Research Division, in screw-worm eradication in Mexico, a joint planning conference to determine our specific goals and responsibilities would seem in order. Perhaps you might wish to discuss this matter with Mr. McDuffie and Dr. Knipling next week at the Corvallis, Oregon meeting.

cc:
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